REMARKS

1. Claims 1 and 18 of this application have been amended to correct some minor infelicities of language. In claim 1, the term "unit" is appropriate and consistent with the other claims in reference to an assembly which includes a number of reactors. Claim 18 is corrected for better comprehension in one passage and, in addition, is amended to specify that the operating pressure is lower than that used before the conversion.

2. This application relates to a method for converting a fixed-bed catalytic reformer unit to a moving-bed unit with continuous or intermittent catalyst feeding facilities to allow continuous or intermittent addition of fresh or regenerated catalyst to the catalyst inlet of the moving-bed reactor and continuous or intermittent removal of spent catalyst from the catalyst outlet of the last moving-bed reactor in the train of reactors. The spent catalyst removed from the reactor is regenerated in a non-integrated regenerator which may be an offsite regenerator, a centrally located on-site regenerator which serves several reforming units or a regenerator shared with a second moving bed unit. The converted unit is operated at an effective reactor pressure to improve reformate quality and yield compared to the reformate product from the fixed-bed unit before the conversion. Typically, this reactor pressure will be lower than that of the fixed bed unit whose reactors have been replaced but lower than the pressure which would be used in a full conversion to a continuous catalytic regenerator reformer with its own dedicated reactor.

3. As previously discussed in this record, technical and economic advantages of the continuous catalytic reforming process did not lead to the immediate demise of the older semi-regenerative and cyclic units which had already been installed and, in many cases, fully depreciated in their refinery economics. The underlying reason is that a continuous reforming unit is a major capital item, is expensive and often cannot be justified in times when refinery profit margins have been as razor-thin as they have been in recent years in highly competitive product markets.

4. These economic factors were realized by the pioneer of the continuous reforming process, UOP, as shown by the cited Golem reference (NPRA Paper AM-89-47 ("Conversion of Fixed Bed Reformers to UOP CCR Platforming Technology, Golem et

al). The authors of this reference recommend a number of approaches in which some of the benefits of the fully continuous operation may be obtained without going to the higher cost of a complete unit replacement. The paper describes three alternatives in the conversions of a fixed bed reformer unit to the UOP CCR technology, two of which are the *full* conversions to CCR with moving bed reactors and *fully-integrated* moving bed regenerators (first and second generation CCR Platforming options, see page 6). Thus, UOP only offers one lower cost alternative to the conversion to a complete CCR, namely, the Hybrid CCR Platforming process. The Hybrid CCR Platforming conversion utilizes the existing fixed bed reactors and *adds* a final moving bed reactor with its own associated regenerator which is sized only for the new moving bed reactor (see page 6) although it appears that replacement of one of the fixed-bed reactors by the moving bed reactor may be contemplated (second paragraph, page 7); in any event, fixed bed reactors are retained in the train, unlike the situation in the present invention where all fixed bed reactors are displaced by moving bed reactors.

5. The discussion of the options presented by Golem (referred to also in NPRA Paper AM-03-93 (NPRA 2003 Annual Meeting)) indicates that the problem of regenerator cost was still not resolved by those options: at the least, a moving bed regenerator had to be provided for the additional, final moving bed reactor. The first option described by Golem, the hybridizing option, is one which fails to overcome the inherent problems of the fixed bed unit since it *retains the fixed bed reactors as fixed bed reactors.*

6. The present invention has the objective of providing the technical advantages of complete moving bed reactor operation (lower hydrogen pressure, higher yield, improved product quality) while, at the same time, avoiding the costs associated with moving bed regenerator installation. It does this by installing moving bed reactors but not the associated regenerator. Instead, the catalyst is regenerated separately, either by resort to away-from-the reactor regeneration (usually an off-site operation) or by use of a shared regenerator which effectively reduces costs because of the economies of scale.

7. These unit "conversion" options, as set out in claims 1, 18 and 20 are not described or taught by Golem and this much is acknowledged by the Examiner in the

first full paragraph on page 4 of the Office Action although in the preceding paragraph, the Examiner states that "[t]he revamp in the manner proposed by Golem is believed to result in a unit that is operated as claimed". Applicants' position is that the three different types of revamp described by Golem do *not* result in a unit which operates in the manner claimed: Golem does not disclose an operation in which the catalyst is regenerated in a non-integrated regenerator, as is required by all the current claims. As previously pointed out, Golem only deals with unit conversion options in which an *integrated* moving bed regenerator of some size, small or large, is installed and used in combination with the moving bed reactor(s). For this reason, the Golem reference cannot with justice be applied to the present claims at all since they deal with a different type of conversion scheme. The conclusion of obviousness is therefore faulted from the outset.

8. Setting aside this critical factor, the Examiner makes the rejection under 35 USC 103(a) using Golem in view of Dufresne (U.S. 5,854,162). This secondary reference relates to the regeneration of a used hydrocarbon treatment catalyst which may be a reforming catalyst using an offsite regeneration process (column 3, line 31; column 4, line 33) carried out under specific conditions. The spent catalyst which may be regenerated by this process may be "from a continuous and/or semi-regenerative type reforming process, i.e., a continuous type, semi-regenerative type or mixed type process." (column 4, lines 16-19) and in cases when the catalyst is from a continuous reforming process, Dufresne makes it clear that the off-site regeneration is intended to deal with upset conditions (see column 2, lines 44-59):

9. Dufresne does not contemplate, therefore, that the described regeneration process is to be used as the normal, regularly used, catalyst regeneration technique, either with the continuous type process or, for that matter, the Golem hybrid type process (see Dufresne column 2, lines 34-39). From this it follows that in a continuous catalytic reforming process such as CCR Platforming™, the Dufresne reference contemplates that the catalyst will be regenerated in the conventional *dedicated, integrated* regenerator in normal day-to-day operation. There is no suggestion in Dufresne that the catalyst should be transferred during normal continuous operation to a non-integrated regeneration facility, as required in claims 1, 18 and 20.

10. The Examiner's position is set out on page 4 of the Action:

> "It would have been obvious ...to modify the teachings of the Golem reference by using an offsite regenerator as proposed by Dufresne because this would allow better control of the two regeneration steps (coke removal and oxychlorination)."

11. Dufresne describes his invention as being advantageous because it frees the regeneration conditions from the limitations imposed by integrated operation (see column 2, lines 49-59) but even if it were obvious to modify the Golem teachings by using an offsite regenerator as proposed by Dufresne for the purpose of controlling the regeneration process after a reactor dysfunction (so as to use better regeneration conditions appropriate to the condition of the catalyst following the dysfunction) this still would not render the presently claimed invention obvious according to the standards of 35 USC 103. Dufresne does not disclose a method of operation in which the non-integrated regeneration is carried out as the normal, full-time regeneration method using operating pressure lower than those used in the unit prior to the conversion. The present claims are therefore to be understood as bearing on the manner of the conversion, with reference both to the condition of the unit and its manner of operation before conversion as well as after the conversion. There is nothing in Dufresne which suggests that it would be desirable to use the technique in combination with a moving bed reactor train without its conventionally-associated integrated regenerator following removal of the fixed bed reactors and their replacement by moving bed reactors. Second, there is nothing in Dufresne which suggests the desirability of operating the unit after conversion at a pressure which is lower than that before conversion. In fact, Dufresne is not relevant to the issue of conversion since it provides no hints at all about conversion; it deals only with the unit as it is at the moment; for this reason, Dufresne is incapable of providing any teaching at all about the pressures which are to be used in the converted unit relative to the pressures used prior to conversion.

12. The Examiner has stated (page 4, fourth complete paragraph) that the revamping as disclosed by Golem results in lower pressures used in the process and that the actual pressures used would be based on the desired composition of the product and one

having ordinary skill would adjust the pressures accordingly. The revampings disclosed by Golem will undoubtedly result in lower pressures being used in the moving bed reactors since the use of these lower pressures is one of the main advantages of the continuous, moving bed type operation: the lower pressures favor an equilibrium towards the dehydrogenated products although – and it must be remembered that in petroleum refining processes where competing thermodynamics and kinetics have to be accommodated for optimal results – at the cost of a significantly reduced catalyst cycle length with the consequent need for more frequent regeneration. That much, however, does not alter the fact that Golem does not, as pointed out above, disclose revamps of the kind now claimed in which each and every fixed bed reactor is removed and replaced in total by the moving bed sequence: Golem only discloses the addition of a moving bed reactor to a fixed bed train (Hybrid CCR) or complete conversion to full CCR (first or second generation) with a fully integrated regenerator.

13. Applicants' requirement that the catalyst is transferred for purposes of regeneration to a non-integrated catalyst regeneration facility or shared regenerator (which is one type of non-integrated regenerator) is not met by Golem, as previously pointed out (see response of 15 June 2006, Section 16). The Examiner has not found Applicants' argument on this point to be persuasive on the grounds (Office Action, page 5, first full paragraph) that "Figures 9-11 of Golem clearly show regenerator unit separate from the reactor train". Figures 9 and 11 of Golem show the now-conventional combination of regenerator with a single reactor (Figure 9) or with a reactor stack (Figures 10-11). Obviously, the drawing does show both and equally obviously, the regenerator is a separate vessel from the reactor but this does not imply in any way that the regenerator does not form part of the entire unit (a complete integration of the hydrogen-rich reactor environment with the oxygen-rich regenerator environment is one which is extremely problematical from the viewpoint of operability and, above all, of safety). The point here is that these are *fully-integrated regenerators* which receive their entire flow of catalyst from the reactor or reactor stack with continuous circulation of catalyst from the reactor(s) to the regenerator. Further, even if the Examiner were justified in his assertion that Golem shows a non-integrated regenerator which "can be" operated as a non-integrated regeneration facility or as a shared regenerator, this is an inappropriate standard for assessing the reference under 35 USC 103: the correct

standard is what is disclosed by the reference or can be fairly taken from the reference by a skilled reader. Here, even were the *capability* to exist, this is not to be equated with a teaching of the actual *desirability* of that mode of use absent some other recognized teaching indicating that persons in the art would have recognized that the capability *should* be given actual effect. Here there is no evidence of record which shows that an appropriately skilled person would have considered it desirable to use the fully integrated regenerators of Golem Figures 9-11 as non-integrated regenerators for another reformer unit. The test of obviousness under 35 USC 103 is desirability not mere possibility; the possibility of use as a non-integrated regenerator does not support the examiner's conclusion of obviousness. *In re Nomiya*. 509 F.2d 566. 184 USPQ 607 (CCPA 1975)

14. Taking up the second point raised by the Examiner (Office action, page 5, second and third full paragraphs), that the disclosure in Dufresne provides a suggestion that the offsite regeneration is to be carried out as a routine part of reformer operation is rather lacking in logical support. Concededly, Dufresne discloses offsite regeneration, this much is clear, but the passage cited by the Examiner says nothing about when or to what extent the spent catalyst is taken away from the reformer unit for regeneration, both of which would seem to be necessary aspects of a complete, non-integrated regeneration scheme such as that claimed. Certainly, there is nothing in Dufresne's description which disclosures or suggests anything other than, with reference to moving bed (CCR) units, occasional departures from conventional integrated regeneration in the event of a unit upset to deal with a catalyst with abnormal characteristics making it unsuitable for normal regeneration (column 2, lines 44-59).

15. The range of pressure specified in claims 8, 11 and 19 is, contrary to the Examiner's assertion (Office Action, page 5, final paragraph), significant in the context of a unit with moving bed reactors. The Examiner attempts to justify his position by reference to Golem's reference to an average pressure of 265 psig and a reactor pressure of 171 psig for a Hybrid CCR conversion (the Examiner refers to Golem page 9, last paragraph and page 12, Case 2 Table).

16. The prescriptions in claims 8, 11 and 19 relative to pressure are as follows (SI units converted to English units for comparison):

> Claim 8 The method of claim 7 in which the fixed bed reactor is operated before the conversion at a pressure of 150 to 550 psig and the moving bed reactor is operated after conversion at a pressure which is within the range of 150 to 380 psig and at a value which is lower than that of the fixed bed reactor before conversion.
>
> Claim 11 The method of claim 9 in which the moving bed reactor is operated at a pressure of 150 to 350 psig after conversion.
>
> Claim 19 The method of claim 7 in which the moving bed reactor is operated after the conversion at a pressure which is equal to 20 to 60 percent lower than the pressure within the range of 150 to 550 psig at which the fixed bed reactor is operated before the conversion.

17. The average reactor pressure of 265 psig alluded to by Golem on page 9, last paragraph is in the following context:

> "UOP has conducted hundreds of reformer revamp studies for clients over the past ten years. We have selected one of these studies to illustrate the options available."
> "The unit selected was a semi-regenerative reforming unit designed in the late 1960's for use with R-16* catalyst. The unit was designed....with an average reactor pressure of 265 psig (18.6 kg/cm2)."

18. From this quotation, it is clear that the pressure referred to is the pressure used for the fixed bed semi-regenerative unit in its condition before any conversion was contemplated. Claims 8 and 11, by contrast, refer to the pressure used after the conversion and so the described pre-conversion pressure is largely irrelevant. As far as claim 19 is concerned, the relevant factor is the proportionate drop in pressure relative to the pressure before the conversion and here, the drop is from 265 to 171 psig, a drop of about 35% which is admittedly within the range specified in claim 19 but the type of conversion to which this drop applies is not the type claimed in the present application: the Hybrid CCR conversion involves the addition of a moving bed reactor to a fixed bed train, retaining the fixed bed reactors which is not what the present invention is all about, the present invention replaces all the fixed bed reactors by a moving bed train. So, whatever Golem teaches about pressures in these conversion studies is irrelevant, it has nothing to do with the invention as claimed. The Examiner, moreover, is completely incorrect in making a judicious selection from the prior art disclosure, and then, guided by the claims before him, applying them selectively – and in a factually unsupportable

context - to the claims of the application. Such hindsight, *ex post facto* reconstruction is not in accordance with the proper standards of 35 USC 103.

19. In any event neither Golem nor Dufresne have any disclosure relating to shared regenerator use as claimed in claim 20. The Examiner has not set out any factual findings which would justify a conclusion of obviousness with respect to this manner of operation.

20. For the reasons set out above, it is submitted that the Examiner's conclusion of obviousness is unwarranted by the facts and applicable law and, accordingly, must be set aside. Reconsideration is requested.

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☐ Pursuant to 37 CFR 1.34(a)

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